



To: Lexington Planning Board
Lexington Town Office Building
1625 Massachusetts Avenue
Lexington, MA 02420

Date: October 13, 2021

Memorandum

Project #: 14896.00

From: Nick Skoly, PE

Re: 420/430 Bedford Street Preliminary Subdivision

The Applicant, Boston Properties, is proposing a subdivision on their existing 21 acre property located at 420/430 Bedford Street in Lexington, MA. VHB has reviewed the drainage conditions associated with the proposed subdivision and the following memorandum documents the stormwater design and mitigation. This drainage analysis accounts for just the subdivision right of way and any stormwater improvements required for the respective lots will be provided at the time of development.

Existing Conditions

The existing site contains a two office buildings surrounded by parking lots, with some landscaping and minimal sidewalks. The Limit of Work (area of the Proposed Subdivision) is approximately 12,500 sf and contains the existing site drive and associated landscaped area. The Project area is 42% impervious and generally grades from a high point at the ROW line with Bedford Street into the property. The stormwater runoff from the site is collected in existing catch basins on site and discharges directly to the existing wetland. (Refer to Figure 1)

Proposed Conditions

The Project proposes to establish a subdivision cul-de-sac with a 26' wide drive land and landscaped center island. The proposed site will be 66% impervious and existing drainage patterns will be maintained (Refer to Figure 2). There is an increase in approximately 3000 sf of impervious area in the proposed conditions compared to the existing conditions. There is a subsurface infiltration system proposed to provide water quality prior to discharge as well as to mitigate for rates and volumes to comply with the Lexington Stormwater policy (existing impervious area disturbed is treated as pervious in the existing condition), The subsurface infiltration system totals approximately 2,000 cf in storage and provides for approximately 950 cf of statically sized water quality volume. The subsurface system provides the required 1" of water quality volume.

Below are tables documenting decrease in peak runoff rate and decrease in stormwater runoff volume for the project:

Table 1 Peak Discharge Rates (cfs*)

Design Point 1: Cul-de-Sac	2-year	10-year	100-year
Existing	0.1	0.5	1.3
Proposed	0.0	0.5	1.2

Table 2 Stormwater Runoff Volume (cf*)

Design Point 1: Cul-de-Sac	1-year
Existing	237
Proposed	0

Conclusion

The Proposed Project will maintain existing drainage patterns while reducing peak rates as well as improving water quality compared to the existing untreated site. Overall, the Project provides an improvement to the stormwater management over the existing conditions and meets the Town's policy on stormwater management.



Water Quality Volume Calculations

Project Name: 420/430 Bedford Street

Proj. No.: 14896.00

Project Location: Lexington, MA

Date: 9/20/2021

Calculated by: NJS

Checked by:

Required:

	Runoff Depth to be Treated (in.)	Impervious Area (acres)	<u>Required Volume (c.f.)</u>
Site Water Quality Volume*	1	0.19	690

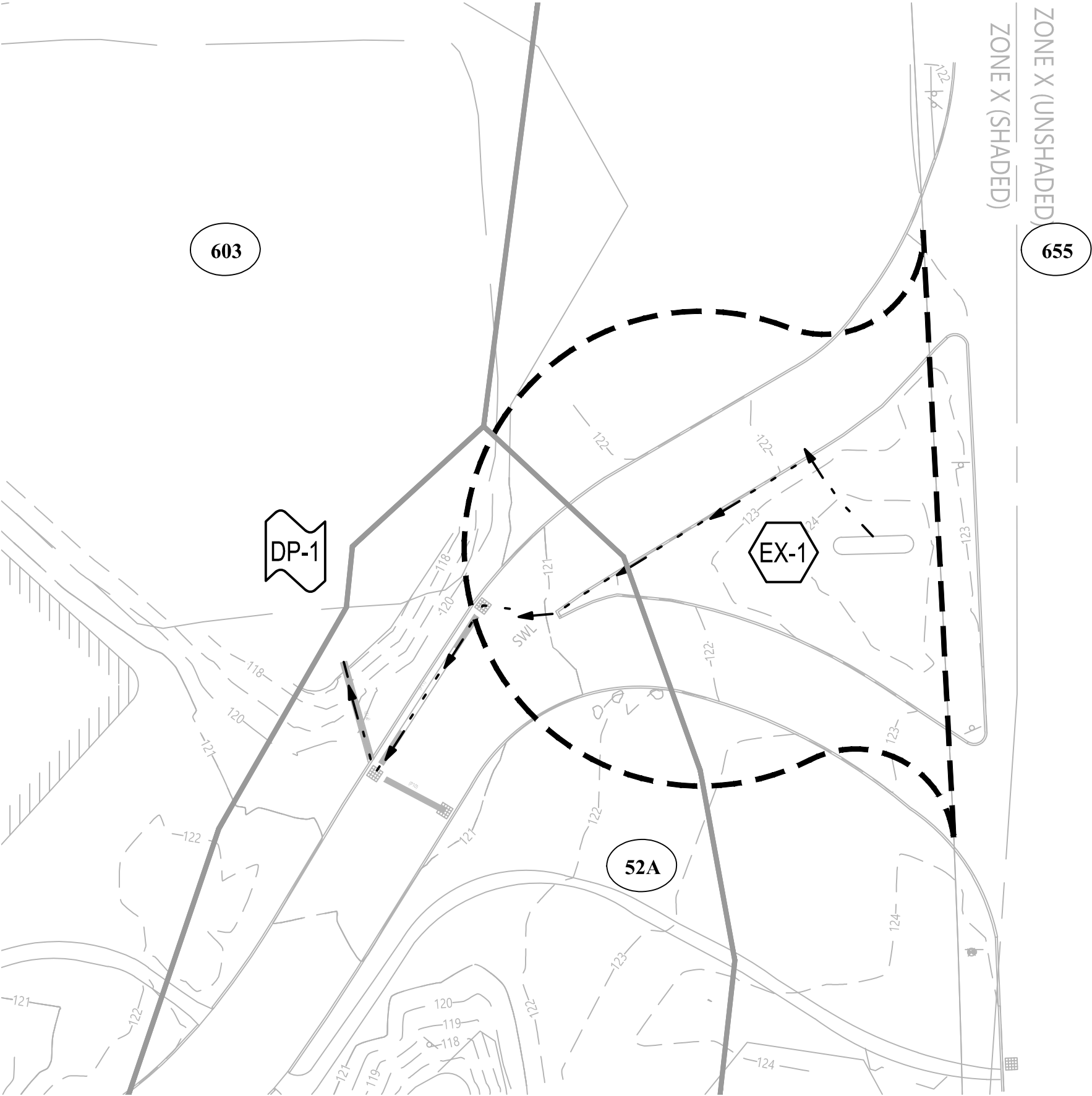
Total Required Volume: 690

Provided:

StormTech

<u>Volume Below Lowest Outlet</u>
947

Volume Below Lowest Outlet in Subsurface Infiltration Chambers 947



Legend

X

DESIGN POINT

X

DRAINAGE AREA DESIGNATION

X

POND

DRAINAGE AREA BOUNDARY

TIME OF CONCENTRATION FLOW LINE

SOIL TYPE BOUNDARY

100' BUFFER ZONE

WETLAND BOUNDARY

52A

FREETOWN MUCK, 0 TO 1 PERCENT SLOPES

603

URBAN LAND, WET SUBSTRATUM

655

UDORTHENTS, WET SUBSTRATUM

01530 Feet

Existing Drainage Conditions

420 & 430 Bedford Street
Lexington, MA

Figure 1

10/13/2021



Bedford Street
60' Right of Way

Legend

SYMBOLS

X

DESIGN POINT

X

DRAINAGE AREA DESIGNATION

X

POND

LINETYPES

DRAINAGE AREA BOUNDARY

TIME OF CONCENTRATION FLOW LINE

SOIL TYPE BOUNDARY

100' BUFFER ZONE

WETLAND BOUNDARY

4-220 4-219

SCS SOIL CLASSIFICATIONS

52A

FREETOWN MUCK,
0 TO 1 PERCENT SLOPES

603

URBAN LAND,
WET SUBSTRATUM

655

UDORTHENTS,
WET SUBSTRATUM

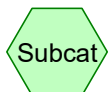
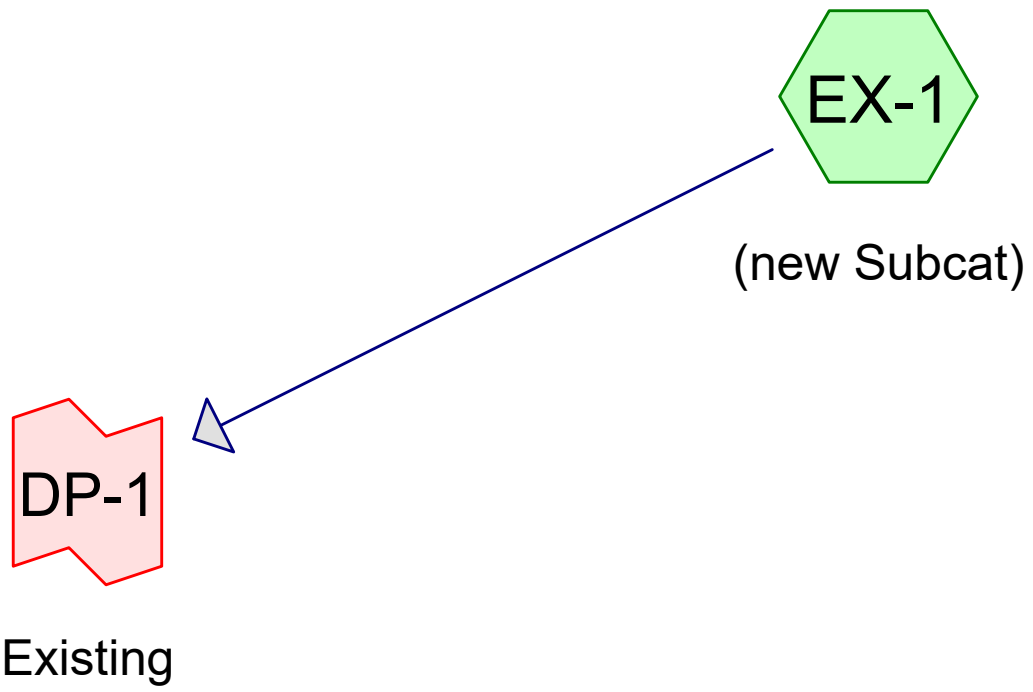


Proposed Drainage Conditions

420 & 430 Bedford Street
Lexington, MA

Figure 2

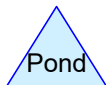
10/13/2021



Subcat



Reach



Pond



Link

Routing Diagram for 14896.00_EX_Subdivision
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14896.00_EX_Subdivision

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-YR	Type III 24-hr		Default	24.00	1	2.60	2
2	2-YR	Type III 24-hr		Default	24.00	1	3.23	2
3	10-YR	Type III 24-hr		Default	24.00	1	5.10	2
4	100-YR	Type III 24-hr		Default	24.00	1	8.08	2

14896.00_EX_Subdivision

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
7,250	61	>75% Grass cover, Good, HSG B (EX-1)
5,300	61	Paved parking treated as pervious, HSG B (EX-1)
12,550	61	TOTAL AREA

14896.00_EX_Subdivision

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
12,550	HSG B	EX-1
0	HSG C	
0	HSG D	
0	Other	
12,550		TOTAL AREA

14896.00_EX_Subdivision*Type III 24-hr 1-YR Rainfall=2.60"*

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Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: (new Subcat)

Runoff Area=12,550 sf 0.00% Impervious Runoff Depth=0.23"

Tc=0.0 min CN=61 Runoff=0.03 cfs 237 cf

Link DP-1: Existing

Inflow=0.03 cfs 237 cf

Primary=0.03 cfs 237 cf

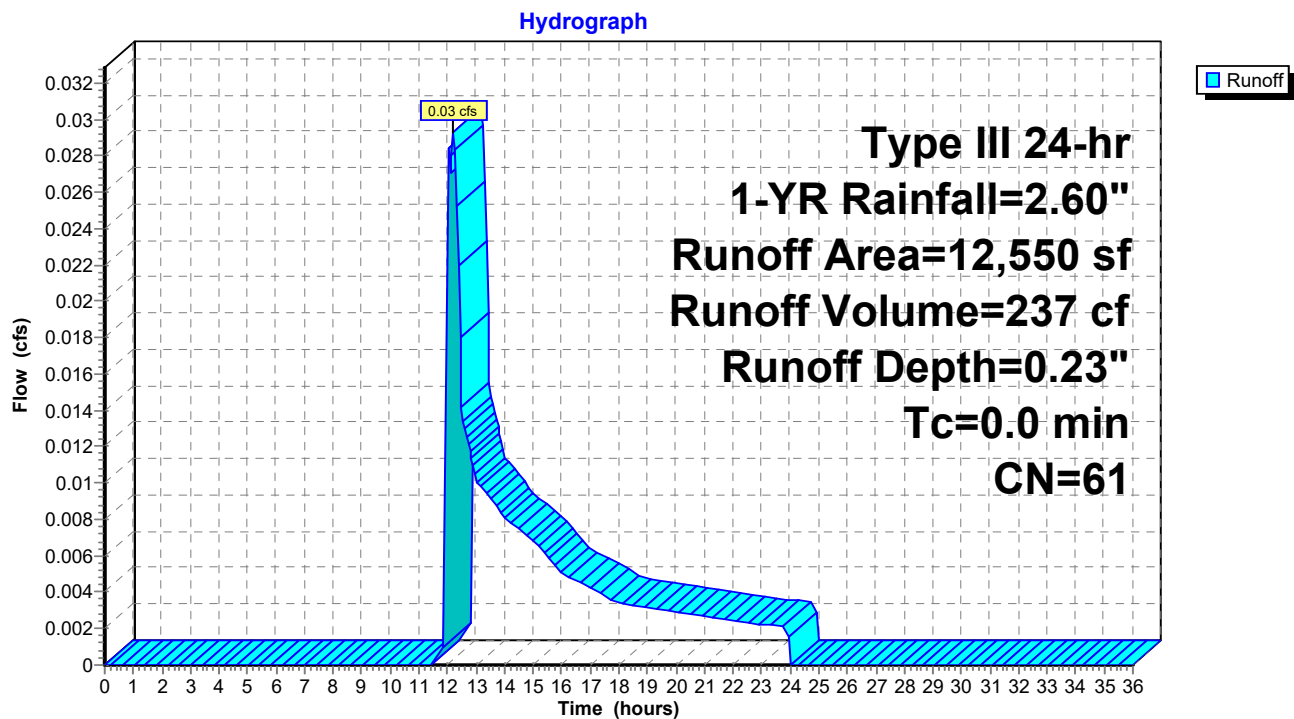
Total Runoff Area = 12,550 sf Runoff Volume = 237 cf Average Runoff Depth = 0.23"
100.00% Pervious = 12,550 sf 0.00% Impervious = 0 sf

Summary for Subcatchment EX-1: (new Subcat)

Runoff = 0.03 cfs @ 12.22 hrs, Volume= 237 cf, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YR Rainfall=2.60"

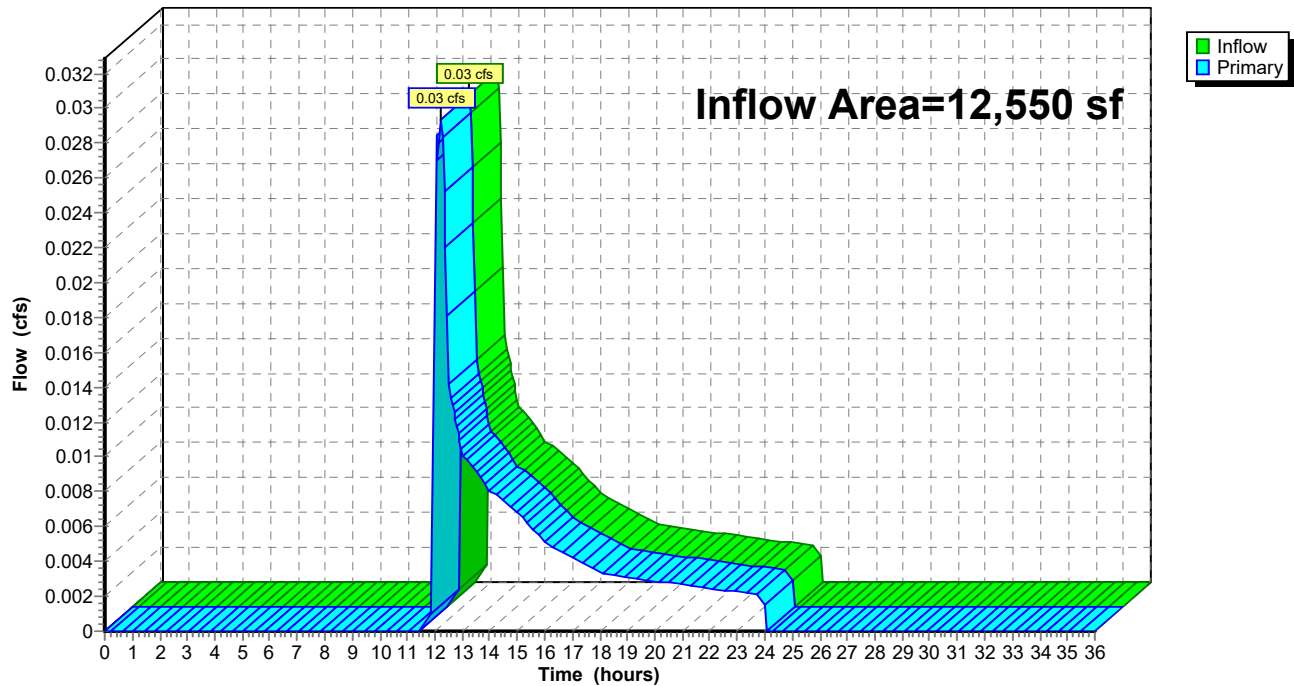
Area (sf)	CN	Description
7,250	61	>75% Grass cover, Good, HSG B
* 5,300	61	Paved parking treated as pervious, HSG B
12,550	61	Weighted Average
12,550		100.00% Pervious Area

Subcatchment EX-1: (new Subcat)

Summary for Link DP-1: Existing

Inflow Area = 12,550 sf, 0.00% Impervious, Inflow Depth = 0.23" for 1-YR event
Inflow = 0.03 cfs @ 12.22 hrs, Volume= 237 cf
Primary = 0.03 cfs @ 12.22 hrs, Volume= 237 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-1: Existing**Hydrograph**

14896.00_EX_Subdivision*Type III 24-hr 2-YR Rainfall=3.23"*

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Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: (new Subcat)

Runoff Area=12,550 sf 0.00% Impervious Runoff Depth=0.46"

Tc=0.0 min CN=61 Runoff=0.11 cfs 477 cf

Link DP-1: Existing

Inflow=0.11 cfs 477 cf

Primary=0.11 cfs 477 cf

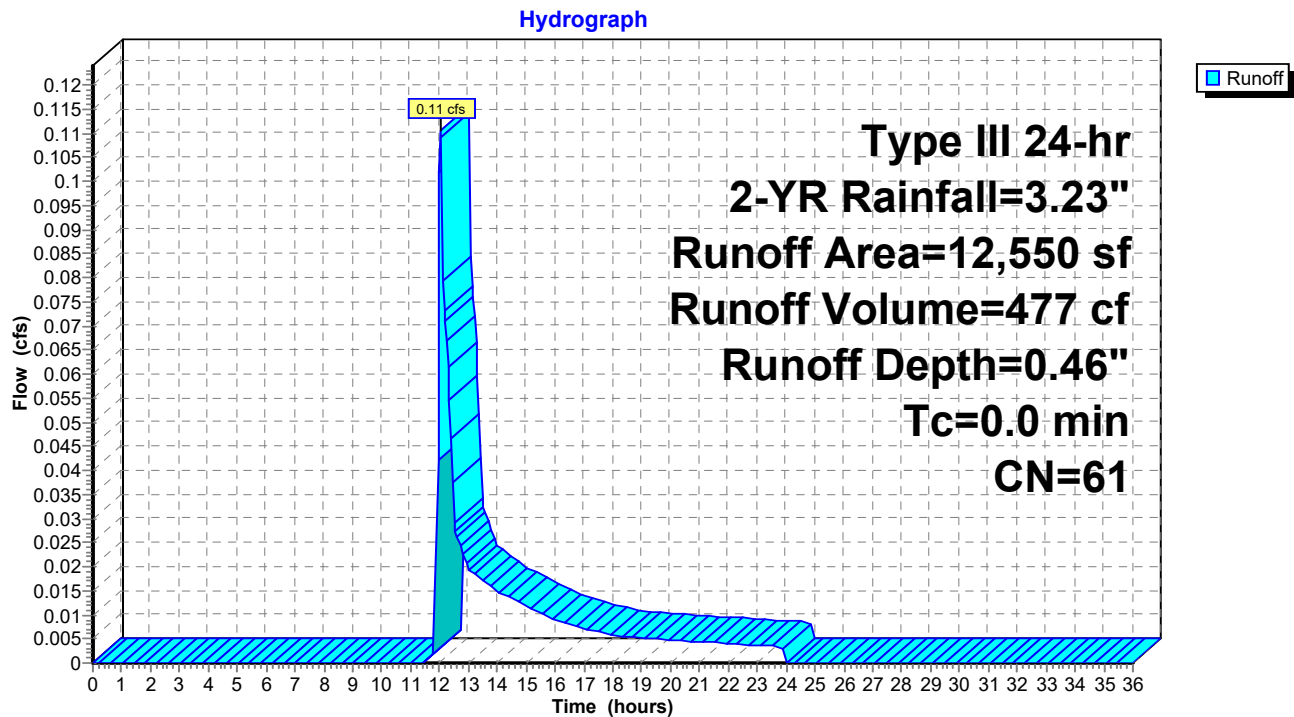
Total Runoff Area = 12,550 sf Runoff Volume = 477 cf Average Runoff Depth = 0.46"
100.00% Pervious = 12,550 sf 0.00% Impervious = 0 sf

Summary for Subcatchment EX-1: (new Subcat)

Runoff = 0.11 cfs @ 12.03 hrs, Volume= 477 cf, Depth= 0.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.23"

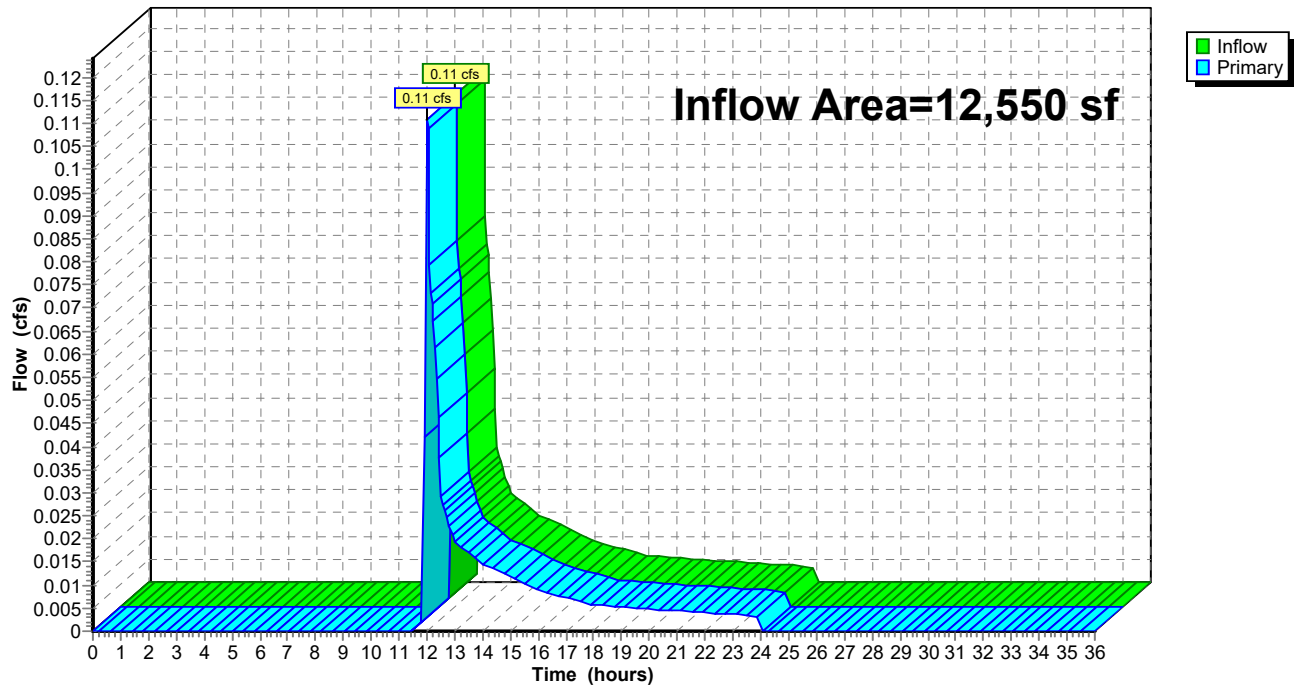
Area (sf)	CN	Description
7,250	61	>75% Grass cover, Good, HSG B
* 5,300	61	Paved parking treated as pervious, HSG B
12,550	61	Weighted Average
12,550		100.00% Pervious Area

Subcatchment EX-1: (new Subcat)

Summary for Link DP-1: Existing

Inflow Area = 12,550 sf, 0.00% Impervious, Inflow Depth = 0.46" for 2-YR event
Inflow = 0.11 cfs @ 12.03 hrs, Volume= 477 cf
Primary = 0.11 cfs @ 12.03 hrs, Volume= 477 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-1: Existing**Hydrograph**

14896.00_EX_Subdivision*Type III 24-hr 10-YR Rainfall=5.10"*

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Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: (new Subcat)

Runoff Area=12,550 sf 0.00% Impervious Runoff Depth=1.43"
Tc=0.0 min CN=61 Runoff=0.51 cfs 1,495 cf

Link DP-1: Existing

Inflow=0.51 cfs 1,495 cf
Primary=0.51 cfs 1,495 cf

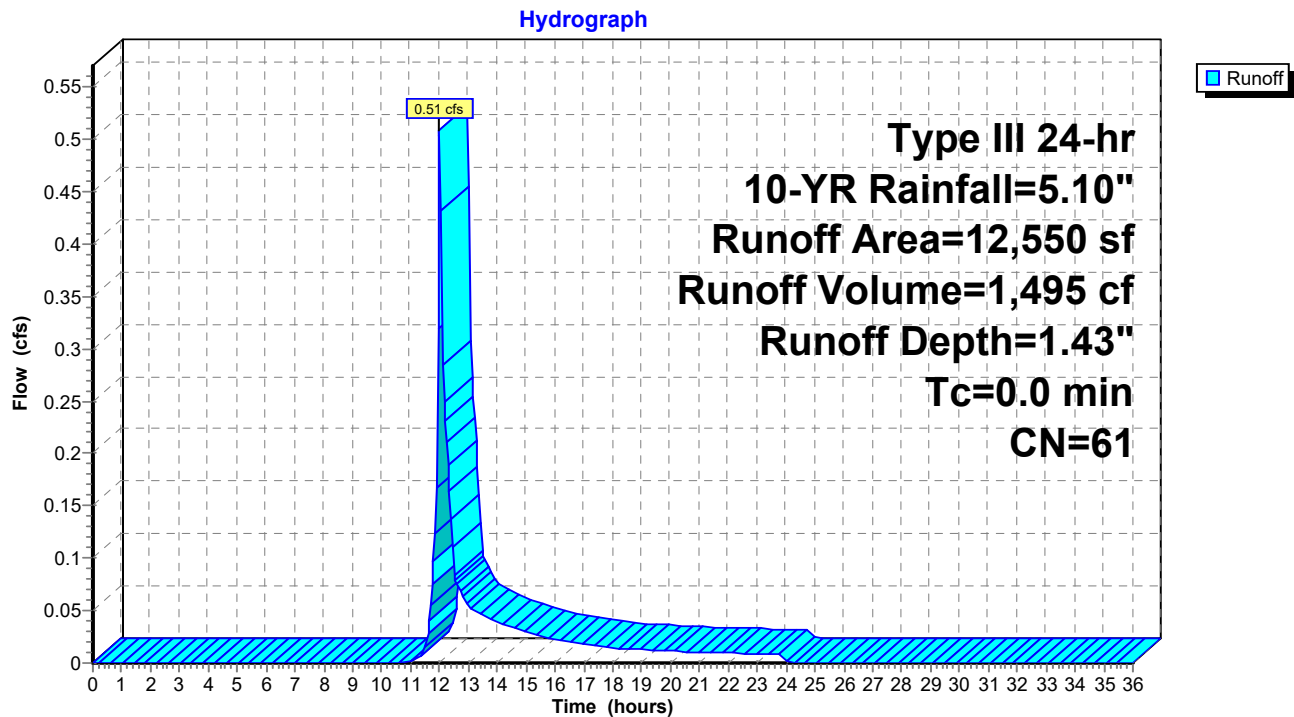
Total Runoff Area = 12,550 sf Runoff Volume = 1,495 cf Average Runoff Depth = 1.43"
100.00% Pervious = 12,550 sf 0.00% Impervious = 0 sf

Summary for Subcatchment EX-1: (new Subcat)

Runoff = 0.51 cfs @ 12.01 hrs, Volume= 1,495 cf, Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.10"

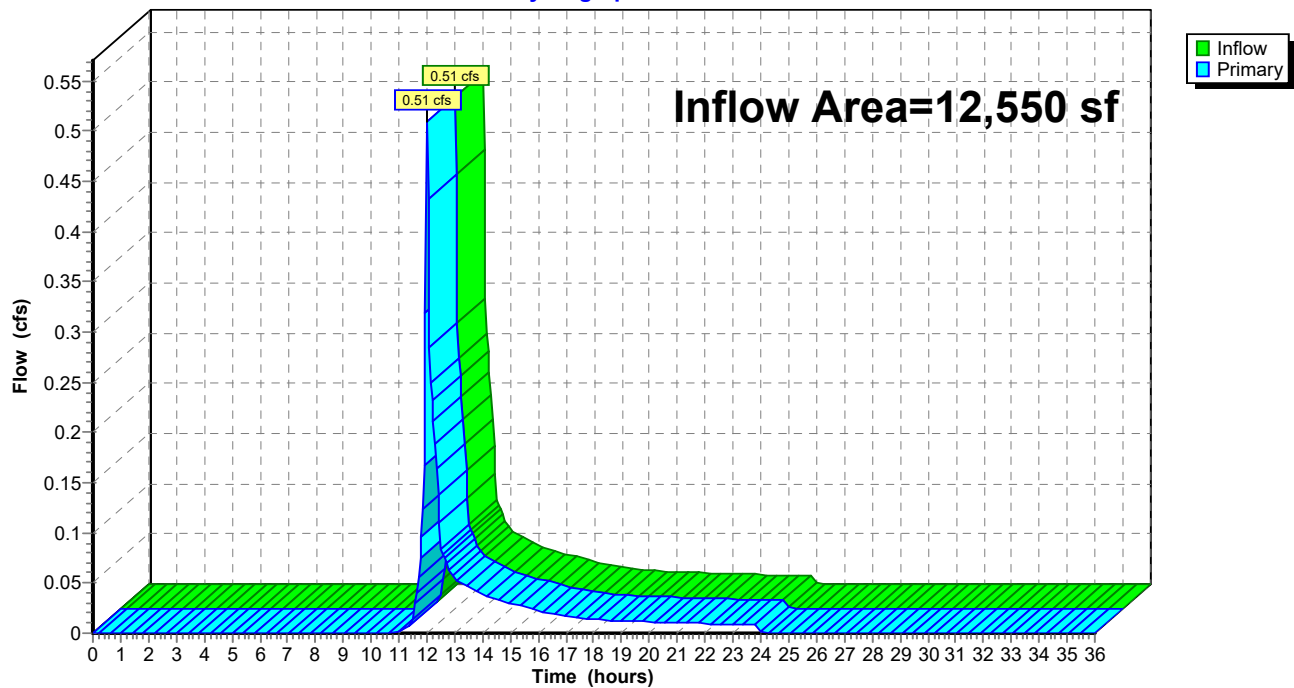
Area (sf)	CN	Description
7,250	61	>75% Grass cover, Good, HSG B
* 5,300	61	Paved parking treated as pervious, HSG B
12,550	61	Weighted Average
12,550		100.00% Pervious Area

Subcatchment EX-1: (new Subcat)

Summary for Link DP-1: Existing

Inflow Area = 12,550 sf, 0.00% Impervious, Inflow Depth = 1.43" for 10-YR event
Inflow = 0.51 cfs @ 12.01 hrs, Volume= 1,495 cf
Primary = 0.51 cfs @ 12.01 hrs, Volume= 1,495 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-1: Existing**Hydrograph**

14896.00_EX_Subdivision*Type III 24-hr 100-YR Rainfall=8.08"*

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Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: (new Subcat)

Runoff Area=12,550 sf 0.00% Impervious Runoff Depth=3.51"

Tc=0.0 min CN=61 Runoff=1.35 cfs 3,666 cf

Link DP-1: Existing

Inflow=1.35 cfs 3,666 cf

Primary=1.35 cfs 3,666 cf

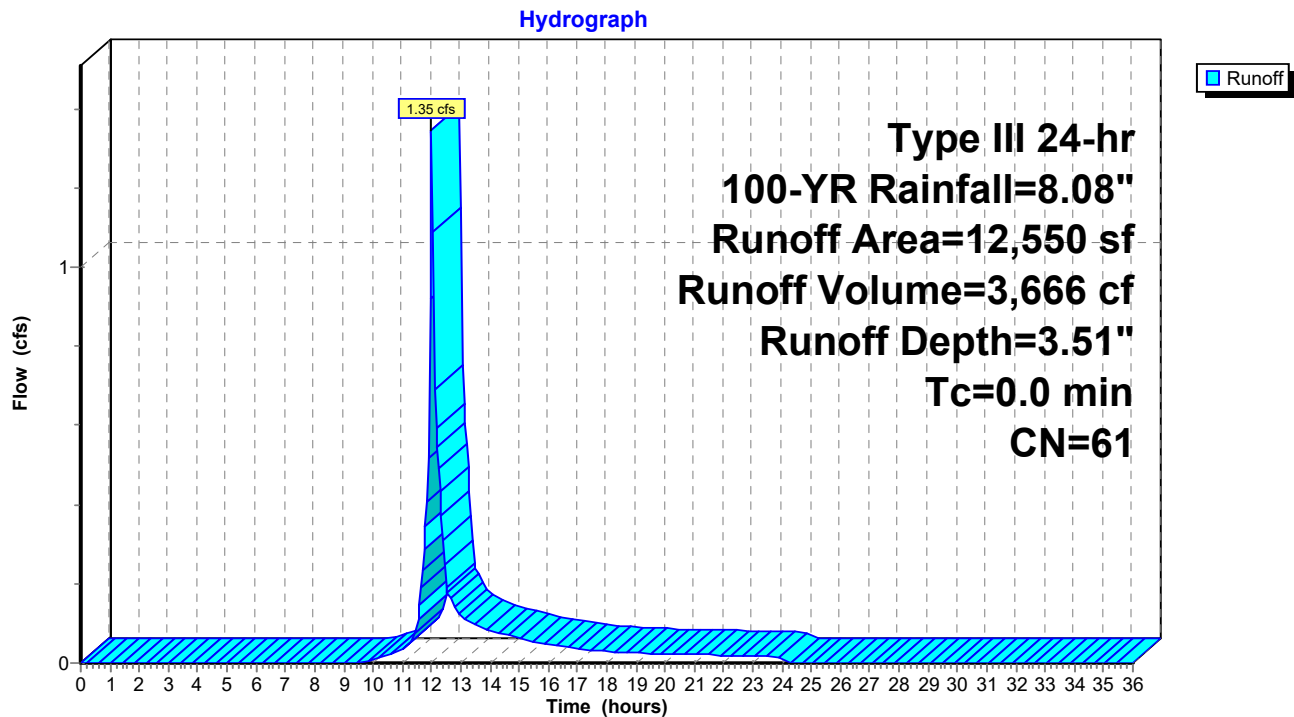
Total Runoff Area = 12,550 sf Runoff Volume = 3,666 cf Average Runoff Depth = 3.51"
100.00% Pervious = 12,550 sf 0.00% Impervious = 0 sf

Summary for Subcatchment EX-1: (new Subcat)

Runoff = 1.35 cfs @ 12.01 hrs, Volume= 3,666 cf, Depth= 3.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.08"

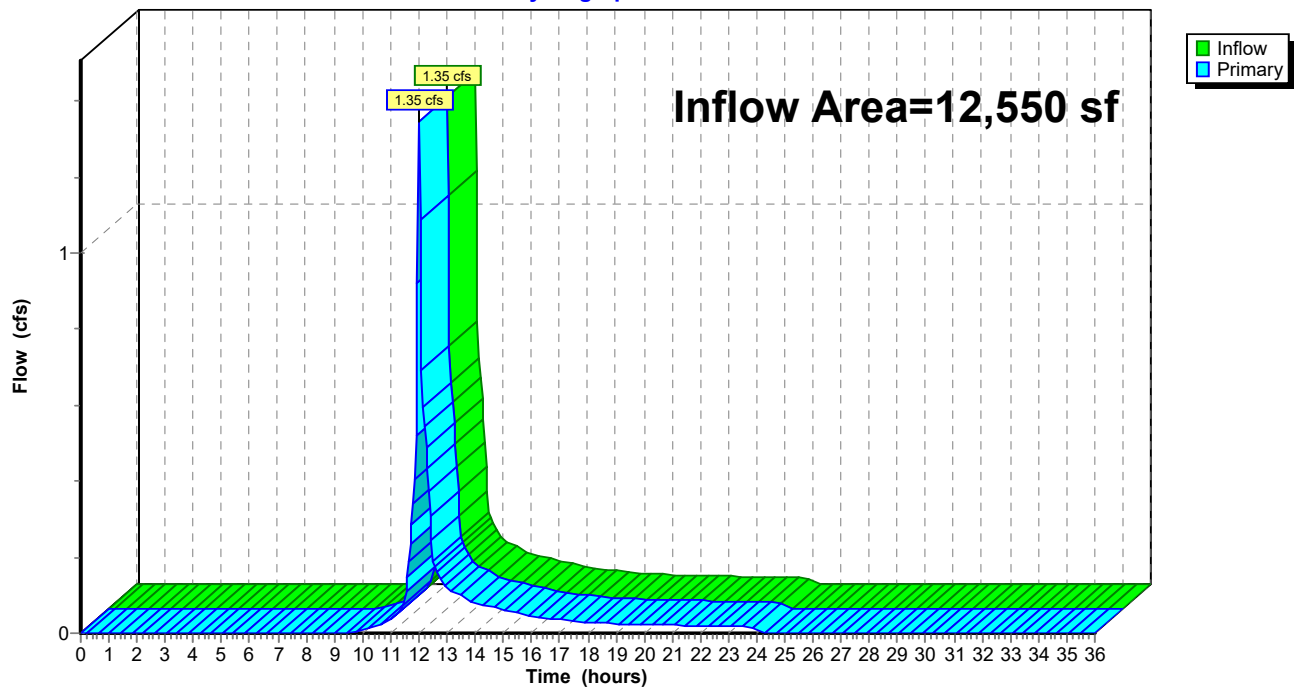
Area (sf)	CN	Description
7,250	61	>75% Grass cover, Good, HSG B
* 5,300	61	Paved parking treated as pervious, HSG B
12,550	61	Weighted Average
12,550		100.00% Pervious Area

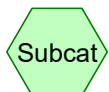
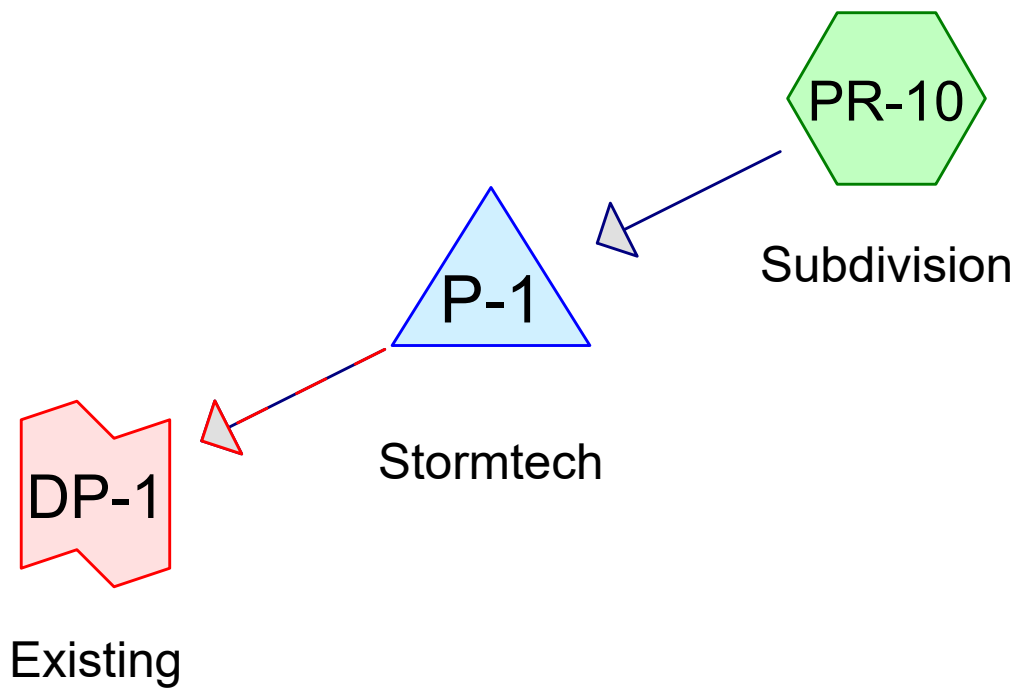
Subcatchment EX-1: (new Subcat)

Summary for Link DP-1: Existing

Inflow Area = 12,550 sf, 0.00% Impervious, Inflow Depth = 3.51" for 100-YR event
Inflow = 1.35 cfs @ 12.01 hrs, Volume= 3,666 cf
Primary = 1.35 cfs @ 12.01 hrs, Volume= 3,666 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

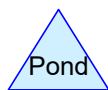
Link DP-1: Existing**Hydrograph**



Subcat



Reach



Pond



Link

Routing Diagram for 14896.00_PR_Subdivision
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14896.00_PR_Subdivision

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-YR	Type III 24-hr		Default	24.00	1	2.60	2
2	2-YR	Type III 24-hr		Default	24.00	1	3.23	2
3	10-YR	Type III 24-hr		Default	24.00	1	5.10	2
4	100-YR	Type III 24-hr		Default	24.00	1	8.08	2

14896.00_PR_Subdivision

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
4,250	61	>75% Grass cover, Good, HSG B (PR-10)
8,300	98	Paved parking, HSG B (PR-10)
12,550	85	TOTAL AREA

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
12,550	HSG B	PR-10
0	HSG C	
0	HSG D	
0	Other	
12,550		TOTAL AREA

14896.00_PR_Subdivision*Type III 24-hr 1-YR Rainfall=2.60"*

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Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR-10: Subdivision

Runoff Area=12,550 sf 66.14% Impervious Runoff Depth=1.26"
Tc=0.0 min CN=85 Runoff=0.49 cfs 1,316 cf

Pond P-1: Stormtech

Peak Elev=117.16' Storage=847 cf Inflow=0.49 cfs 1,316 cf
Discarded=0.01 cfs 1,057 cf Primary=0.00 cfs 0 cf Secondary=0.00 cfs 0 cf Outflow=0.01 cfs 1,057 cf

Link DP-1: Existing

Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

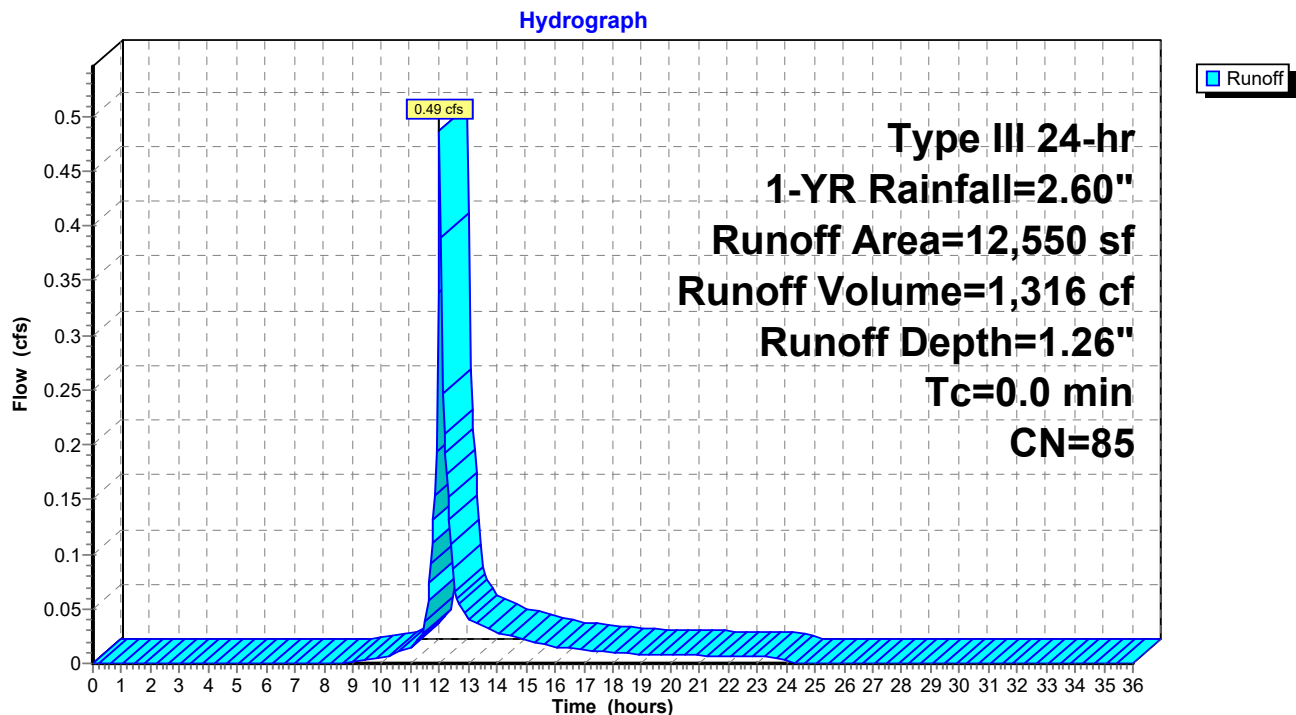
Total Runoff Area = 12,550 sf Runoff Volume = 1,316 cf Average Runoff Depth = 1.26"
33.86% Pervious = 4,250 sf 66.14% Impervious = 8,300 sf

Summary for Subcatchment PR-10: Subdivision

Runoff = 0.49 cfs @ 12.01 hrs, Volume= 1,316 cf, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-YR Rainfall=2.60"

Area (sf)	CN	Description
4,250	61	>75% Grass cover, Good, HSG B
8,300	98	Paved parking, HSG B
12,550	85	Weighted Average
4,250		33.86% Pervious Area
8,300		66.14% Impervious Area

Subcatchment PR-10: Subdivision

Summary for Pond P-1: Stormtech

Inflow Area = 12,550 sf, 66.14% Impervious, Inflow Depth = 1.26" for 1-YR event
 Inflow = 0.49 cfs @ 12.01 hrs, Volume= 1,316 cf
 Outflow = 0.01 cfs @ 11.15 hrs, Volume= 1,057 cf, Atten= 98%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 11.15 hrs, Volume= 1,057 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 117.16' @ 17.34 hrs Surf.Area= 950 sf Storage= 847 cf

Plug-Flow detention time= 637.7 min calculated for 1,056 cf (80% of inflow)
 Center-of-Mass det. time= 560.4 min (1,390.6 - 830.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	115.80'	889 cf	20.50'W x 46.34'L x 3.50'H Field A 3,325 cf Overall - 1,103 cf Embedded = 2,222 cf x 40.0% Voids
#2A	116.30'	1,103 cf	ADS_StormTech SC-740 +Cap x 24 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 24 Chambers in 4 Rows
#3	115.80'	63 cf	4.00'D x 5.00'H Manhole -Impervious
#4	120.30'	50 cf	Custom Stage Data (Prismatic) Listed below (Recalc) -Impervious
		2,104 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.30	100	0	0
120.80	100	50	50

Device	Routing	Invert	Outlet Devices
#1	Discarded	115.80'	0.520 in/hr Exfiltration over Surface area
#2	Primary	115.90'	12.0" Round Culvert L= 10.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 115.90' / 115.80' S= 0.0100 ' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	117.30'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Secondary	120.30'	5.0' long x 5.0' breadth Top of Structure Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.01 cfs @ 11.15 hrs HW=115.85' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=115.80' (Free Discharge)

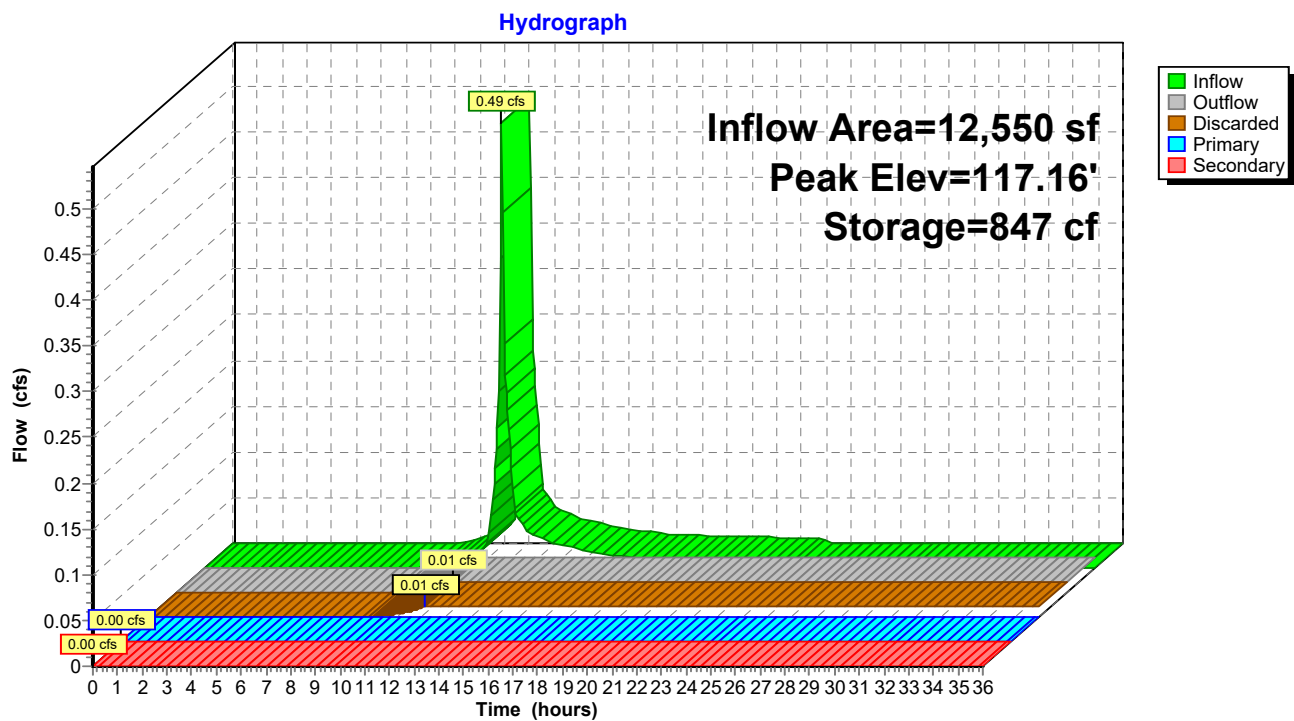
↑2=Culvert (Controls 0.00 cfs)

↑3=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=115.80' (Free Discharge)

↑4=Top of Structure (Controls 0.00 cfs)

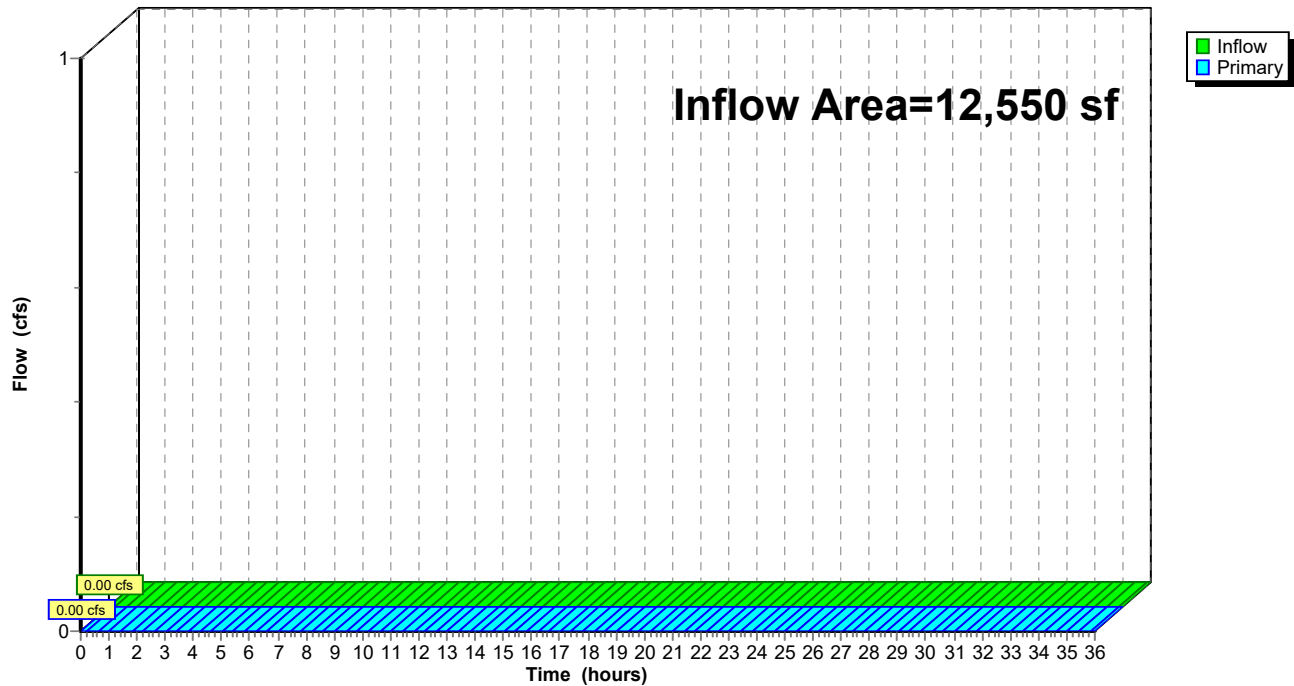
Pond P-1: Stormtech



Summary for Link DP-1: Existing

Inflow Area = 12,550 sf, 66.14% Impervious, Inflow Depth = 0.00" for 1-YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-1: Existing**Hydrograph**

14896.00_PR_Subdivision*Type III 24-hr 2-YR Rainfall=3.23"*

Prepared by VHB

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Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR-10: Subdivision

Runoff Area=12,550 sf 66.14% Impervious Runoff Depth=1.78"
Tc=0.0 min CN=85 Runoff=0.69 cfs 1,865 cf

Pond P-1: Stormtech

Peak Elev=117.41' Storage=1,023 cf Inflow=0.69 cfs 1,865 cf
Discarded=0.01 cfs 1,089 cf Primary=0.03 cfs 362 cf Secondary=0.00 cfs 0 cf Outflow=0.05 cfs 1,451 cf

Link DP-1: Existing

Inflow=0.03 cfs 362 cf
Primary=0.03 cfs 362 cf

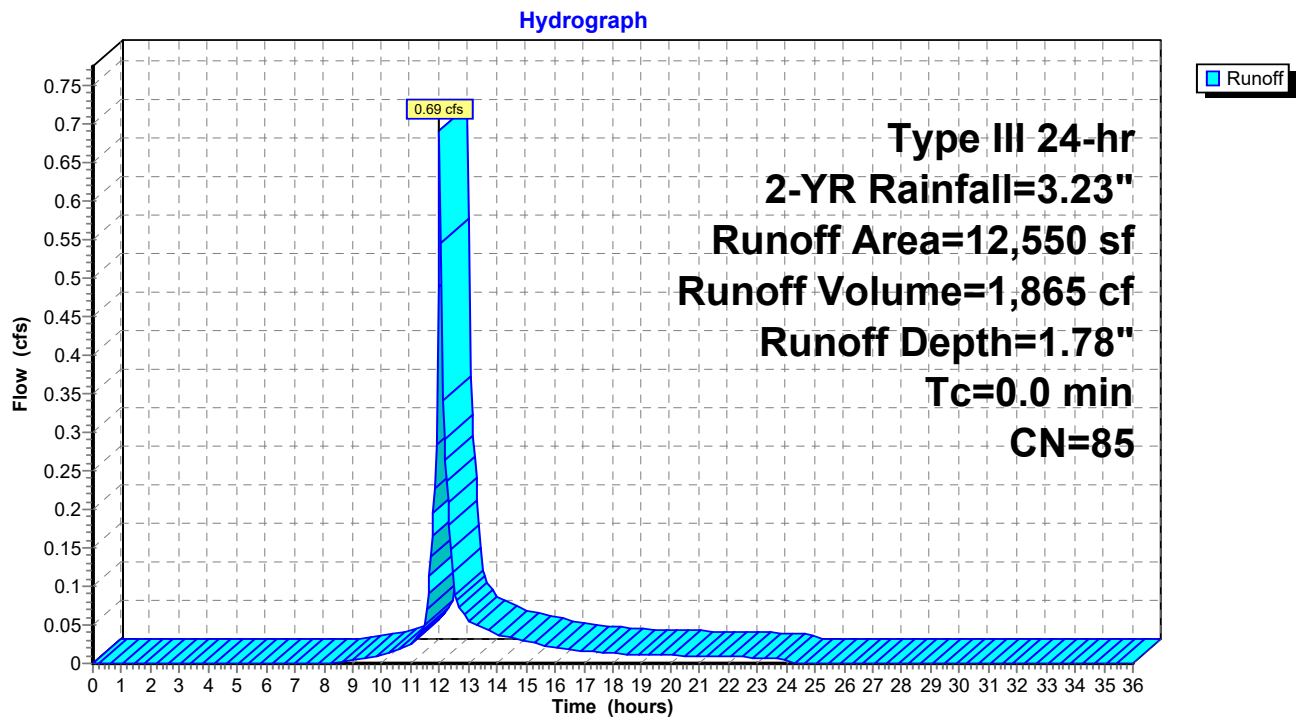
Total Runoff Area = 12,550 sf Runoff Volume = 1,865 cf Average Runoff Depth = 1.78"
33.86% Pervious = 4,250 sf 66.14% Impervious = 8,300 sf

Summary for Subcatchment PR-10: Subdivision

Runoff = 0.69 cfs @ 12.00 hrs, Volume= 1,865 cf, Depth= 1.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.23"

Area (sf)	CN	Description
4,250	61	>75% Grass cover, Good, HSG B
8,300	98	Paved parking, HSG B
12,550	85	Weighted Average
4,250		33.86% Pervious Area
8,300		66.14% Impervious Area

Subcatchment PR-10: Subdivision

Summary for Pond P-1: Stormtech

Inflow Area = 12,550 sf, 66.14% Impervious, Inflow Depth = 1.78" for 2-YR event
 Inflow = 0.69 cfs @ 12.00 hrs, Volume= 1,865 cf
 Outflow = 0.05 cfs @ 13.48 hrs, Volume= 1,451 cf, Atten= 93%, Lag= 88.4 min
 Discarded = 0.01 cfs @ 10.45 hrs, Volume= 1,089 cf
 Primary = 0.03 cfs @ 13.48 hrs, Volume= 362 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 117.41' @ 13.48 hrs Surf.Area= 950 sf Storage= 1,023 cf

Plug-Flow detention time= 511.5 min calculated for 1,451 cf (78% of inflow)
 Center-of-Mass det. time= 428.9 min (1,249.0 - 820.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	115.80'	889 cf	20.50'W x 46.34'L x 3.50'H Field A 3,325 cf Overall - 1,103 cf Embedded = 2,222 cf x 40.0% Voids
#2A	116.30'	1,103 cf	ADS_StormTech SC-740 +Cap x 24 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 24 Chambers in 4 Rows
#3	115.80'	63 cf	4.00'D x 5.00'H Manhole -Impervious
#4	120.30'	50 cf	Custom Stage Data (Prismatic) Listed below (Recalc) -Impervious
		2,104 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.30	100	0	0
120.80	100	50	50

Device	Routing	Invert	Outlet Devices
#1	Discarded	115.80'	0.520 in/hr Exfiltration over Surface area
#2	Primary	115.90'	12.0" Round Culvert L= 10.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 115.90' / 115.80' S= 0.0100 ' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	117.30'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Secondary	120.30'	5.0' long x 5.0' breadth Top of Structure Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.01 cfs @ 10.45 hrs HW=115.85' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.03 cfs @ 13.48 hrs HW=117.41' (Free Discharge)

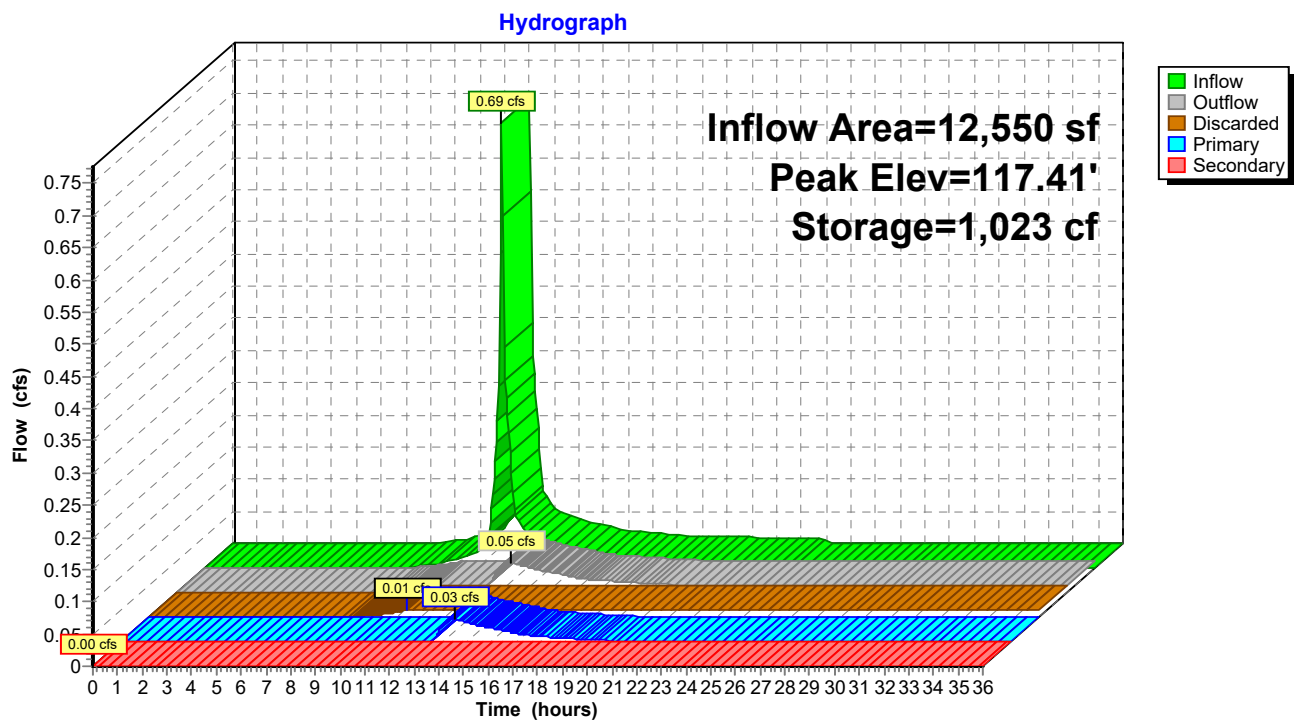
↑ **2=Culvert** (Passes 0.03 cfs of 3.69 cfs potential flow)

↑ **3=Orifice/Grate** (Orifice Controls 0.03 cfs @ 1.11 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=115.80' (Free Discharge)

↑ **4=Top of Structure** (Controls 0.00 cfs)

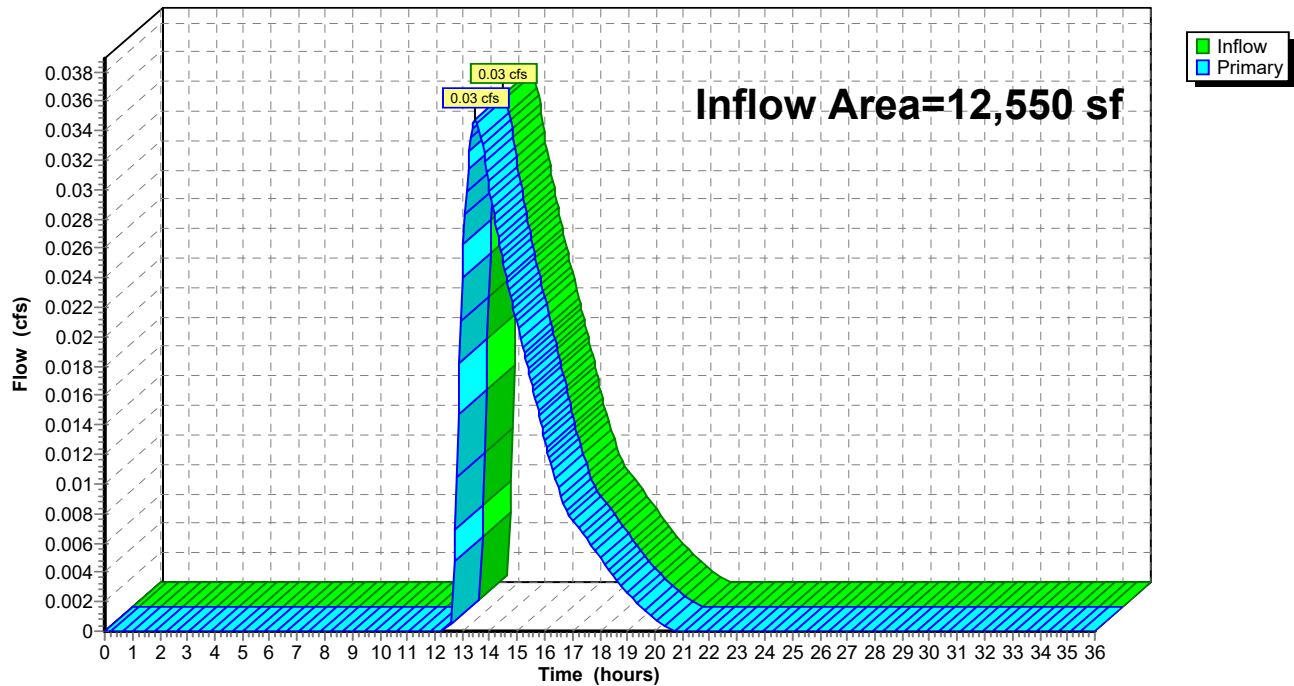
Pond P-1: Stormtech



Summary for Link DP-1: Existing

Inflow Area = 12,550 sf, 66.14% Impervious, Inflow Depth = 0.35" for 2-YR event
Inflow = 0.03 cfs @ 13.48 hrs, Volume= 362 cf
Primary = 0.03 cfs @ 13.48 hrs, Volume= 362 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-1: Existing**Hydrograph**

14896.00_PR_Subdivision*Type III 24-hr 10-YR Rainfall=5.10"*

Prepared by VHB

Printed 9/22/2021

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Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR-10: Subdivision

Runoff Area=12,550 sf 66.14% Impervious Runoff Depth=3.46"
Tc=0.0 min CN=85 Runoff=1.33 cfs 3,619 cf

Pond P-1: Stormtech

Peak Elev=117.86' Storage=1,329 cf Inflow=1.33 cfs 3,619 cf
Discarded=0.01 cfs 1,162 cf Primary=0.52 cfs 1,996 cf Secondary=0.00 cfs 0 cf Outflow=0.53 cfs 3,158 cf

Link DP-1: Existing

Inflow=0.52 cfs 1,996 cf
Primary=0.52 cfs 1,996 cf

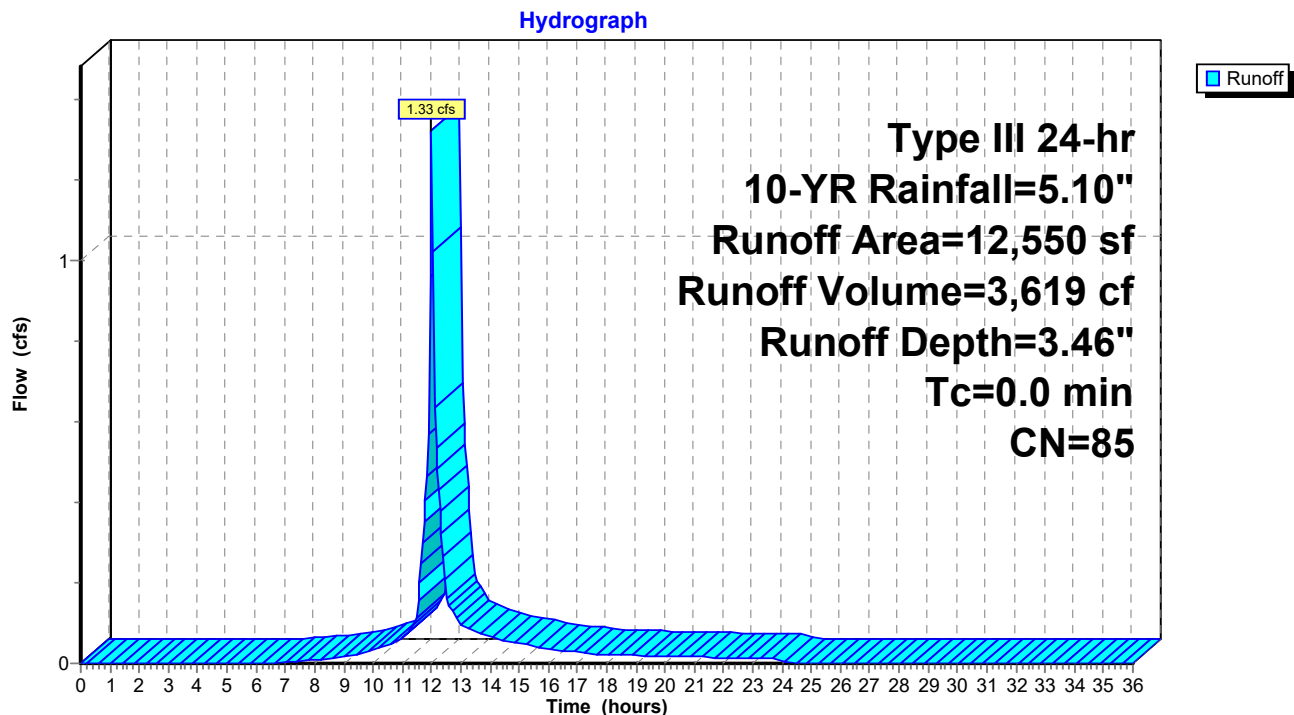
Total Runoff Area = 12,550 sf Runoff Volume = 3,619 cf Average Runoff Depth = 3.46"
33.86% Pervious = 4,250 sf 66.14% Impervious = 8,300 sf

Summary for Subcatchment PR-10: Subdivision

Runoff = 1.33 cfs @ 12.00 hrs, Volume= 3,619 cf, Depth= 3.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.10"

Area (sf)	CN	Description
4,250	61	>75% Grass cover, Good, HSG B
8,300	98	Paved parking, HSG B
12,550	85	Weighted Average
4,250		33.86% Pervious Area
8,300		66.14% Impervious Area

Subcatchment PR-10: Subdivision

Summary for Pond P-1: Stormtech

Inflow Area = 12,550 sf, 66.14% Impervious, Inflow Depth = 3.46" for 10-YR event
 Inflow = 1.33 cfs @ 12.00 hrs, Volume= 3,619 cf
 Outflow = 0.53 cfs @ 12.16 hrs, Volume= 3,158 cf, Atten= 60%, Lag= 9.6 min
 Discarded = 0.01 cfs @ 8.80 hrs, Volume= 1,162 cf
 Primary = 0.52 cfs @ 12.16 hrs, Volume= 1,996 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 117.86' @ 12.16 hrs Surf.Area= 950 sf Storage= 1,329 cf

Plug-Flow detention time= 263.0 min calculated for 3,153 cf (87% of inflow)
 Center-of-Mass det. time= 206.5 min (1,007.7 - 801.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	115.80'	889 cf	20.50'W x 46.34'L x 3.50'H Field A 3,325 cf Overall - 1,103 cf Embedded = 2,222 cf x 40.0% Voids
#2A	116.30'	1,103 cf	ADS_StormTech SC-740 +Cap x 24 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 24 Chambers in 4 Rows
#3	115.80'	63 cf	4.00'D x 5.00'H Manhole -Impervious
#4	120.30'	50 cf	Custom Stage Data (Prismatic) Listed below (Recalc) -Impervious
		2,104 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.30	100	0	0
120.80	100	50	50

Device	Routing	Invert	Outlet Devices
#1	Discarded	115.80'	0.520 in/hr Exfiltration over Surface area
#2	Primary	115.90'	12.0" Round Culvert L= 10.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 115.90' / 115.80' S= 0.0100 ' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	117.30'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Secondary	120.30'	5.0' long x 5.0' breadth Top of Structure Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.01 cfs @ 8.80 hrs HW=115.85' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.52 cfs @ 12.16 hrs HW=117.85' (Free Discharge)

↑ **2=Culvert** (Passes 0.52 cfs of 4.56 cfs potential flow)

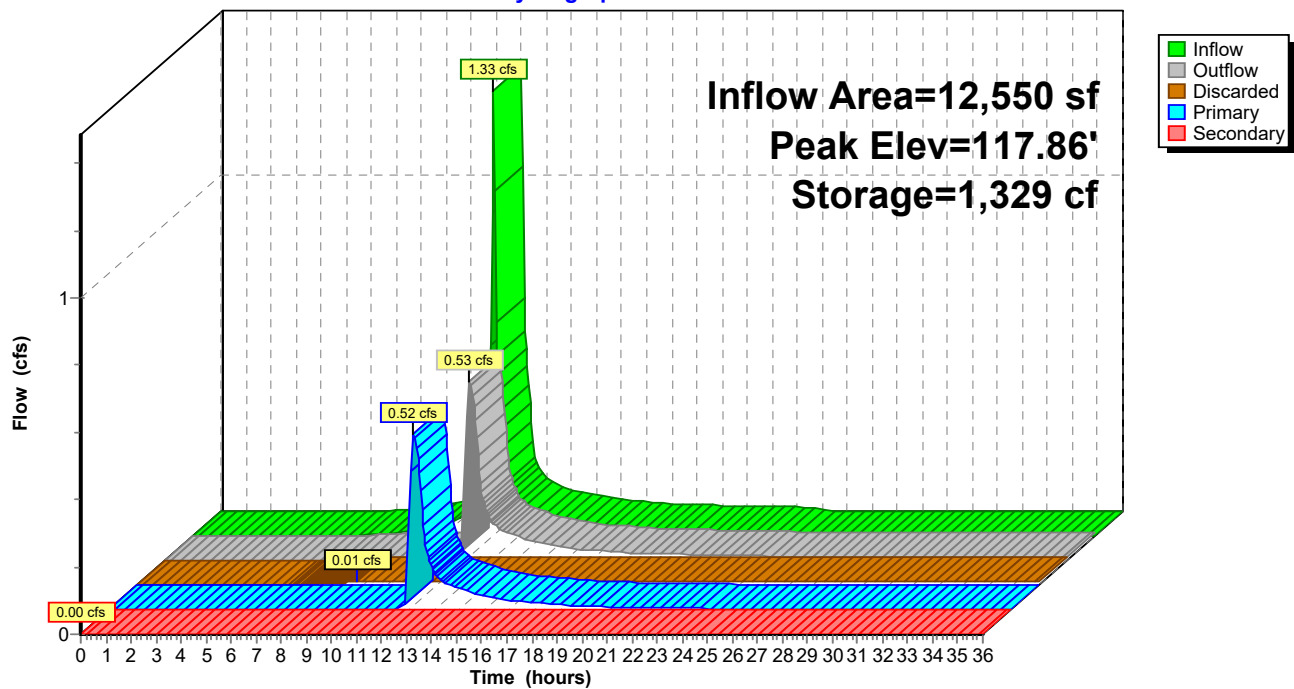
↑ **3=Orifice/Grate** (Orifice Controls 0.52 cfs @ 2.65 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=115.80' (Free Discharge)

↑ **4=Top of Structure** (Controls 0.00 cfs)

Pond P-1: Stormtech

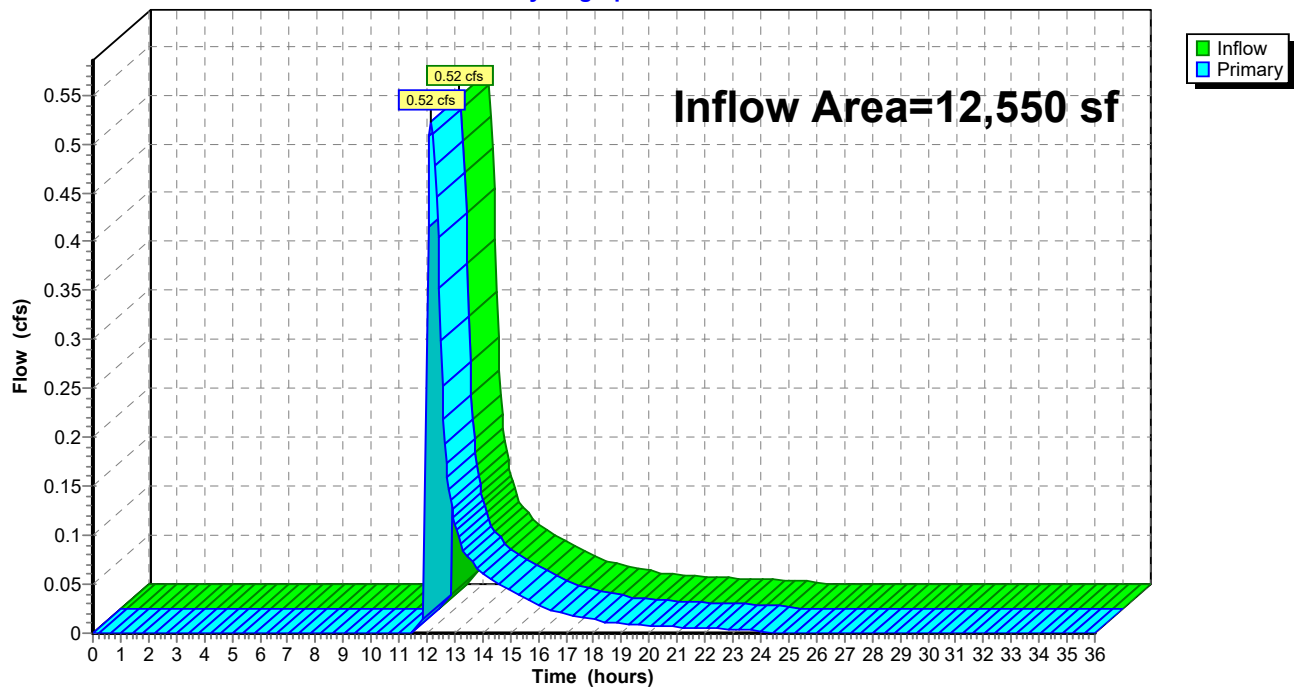
Hydrograph



Summary for Link DP-1: Existing

Inflow Area = 12,550 sf, 66.14% Impervious, Inflow Depth = 1.91" for 10-YR event
Inflow = 0.52 cfs @ 12.16 hrs, Volume= 1,996 cf
Primary = 0.52 cfs @ 12.16 hrs, Volume= 1,996 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-1: Existing**Hydrograph**

14896.00_PR_Subdivision*Type III 24-hr 100-YR Rainfall=8.08"*

Prepared by VHB

Printed 9/22/2021

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Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR-10: Subdivision

Runoff Area=12,550 sf 66.14% Impervious Runoff Depth=6.29"
Tc=0.0 min CN=85 Runoff=2.35 cfs 6,579 cf

Pond P-1: Stormtech

Peak Elev=119.12' Storage=1,965 cf Inflow=2.35 cfs 6,579 cf
Discarded=0.01 cfs 1,244 cf Primary=1.18 cfs 4,854 cf Secondary=0.00 cfs 0 cf Outflow=1.20 cfs 6,098 cf

Link DP-1: Existing

Inflow=1.18 cfs 4,854 cf
Primary=1.18 cfs 4,854 cf

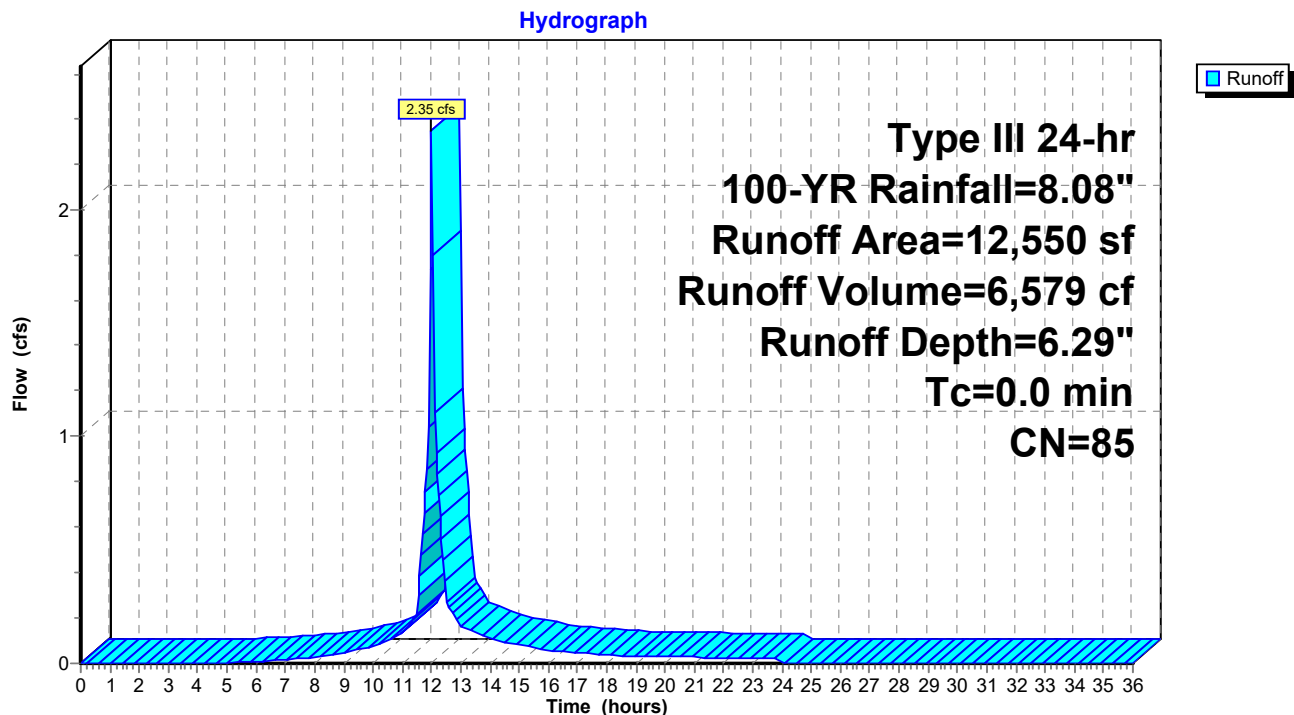
Total Runoff Area = 12,550 sf Runoff Volume = 6,579 cf Average Runoff Depth = 6.29"
33.86% Pervious = 4,250 sf 66.14% Impervious = 8,300 sf

Summary for Subcatchment PR-10: Subdivision

Runoff = 2.35 cfs @ 12.00 hrs, Volume= 6,579 cf, Depth= 6.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.08"

Area (sf)	CN	Description
4,250	61	>75% Grass cover, Good, HSG B
8,300	98	Paved parking, HSG B
12,550	85	Weighted Average
4,250		33.86% Pervious Area
8,300		66.14% Impervious Area

Subcatchment PR-10: Subdivision

Summary for Pond P-1: Stormtech

Inflow Area = 12,550 sf, 66.14% Impervious, Inflow Depth = 6.29" for 100-YR event
 Inflow = 2.35 cfs @ 12.00 hrs, Volume= 6,579 cf
 Outflow = 1.20 cfs @ 12.11 hrs, Volume= 6,098 cf, Atten= 49%, Lag= 6.3 min
 Discarded = 0.01 cfs @ 6.90 hrs, Volume= 1,244 cf
 Primary = 1.18 cfs @ 12.11 hrs, Volume= 4,854 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 119.12' @ 12.11 hrs Surf.Area= 950 sf Storage= 1,965 cf

Plug-Flow detention time= 160.0 min calculated for 6,098 cf (93% of inflow)
 Center-of-Mass det. time= 121.6 min (906.2 - 784.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	115.80'	889 cf	20.50'W x 46.34'L x 3.50'H Field A 3,325 cf Overall - 1,103 cf Embedded = 2,222 cf x 40.0% Voids
#2A	116.30'	1,103 cf	ADS_StormTech SC-740 +Cap x 24 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 24 Chambers in 4 Rows
#3	115.80'	63 cf	4.00'D x 5.00'H Manhole -Impervious
#4	120.30'	50 cf	Custom Stage Data (Prismatic) Listed below (Recalc) -Impervious
		2,104 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
120.30	100	0	0
120.80	100	50	50

Device	Routing	Invert	Outlet Devices
#1	Discarded	115.80'	0.520 in/hr Exfiltration over Surface area
#2	Primary	115.90'	12.0" Round Culvert L= 10.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 115.90' / 115.80' S= 0.0100 ' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	117.30'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Secondary	120.30'	5.0' long x 5.0' breadth Top of Structure Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.01 cfs @ 6.90 hrs HW=115.85' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.18 cfs @ 12.11 hrs HW=119.11' (Free Discharge)

↑ **2=Culvert** (Passes 1.18 cfs of 6.23 cfs potential flow)

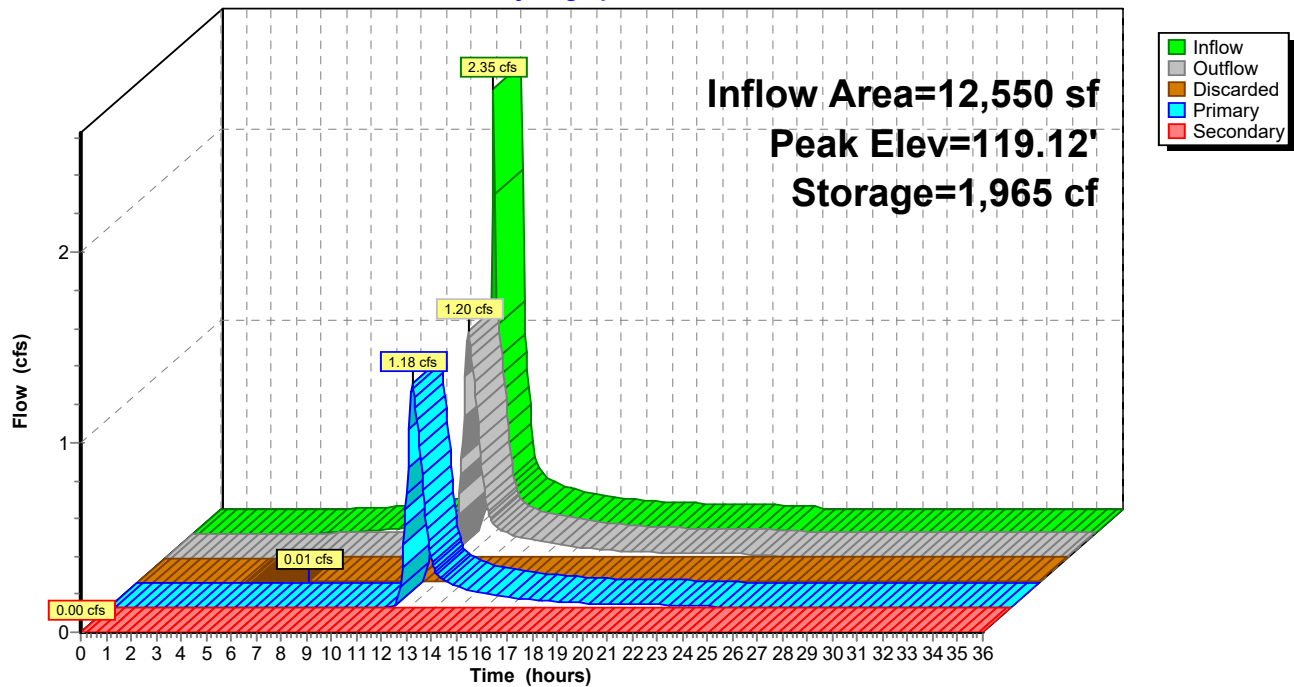
↑ **3=Orifice/Grate** (Orifice Controls 1.18 cfs @ 6.01 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=115.80' (Free Discharge)

↑ **4=Top of Structure** (Controls 0.00 cfs)

Pond P-1: Stormtech

Hydrograph



Summary for Link DP-1: Existing

Inflow Area = 12,550 sf, 66.14% Impervious, Inflow Depth = 4.64" for 100-YR event
Inflow = 1.18 cfs @ 12.11 hrs, Volume= 4,854 cf
Primary = 1.18 cfs @ 12.11 hrs, Volume= 4,854 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP-1: Existing**Hydrograph**